ASTRONOMICAL SOCIETY OF LONDON.

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The following communications were read: —

1. On an appearance of divisions in the exterior ring of Saturn. By Captain Henry Kater, Vice President and Treasurer of the Royal Society.

The observations which form the subject of this paper were made in the years 1825 and 1826, and remained unpublished from a wish on the part of the observer to witness the appearances again, — but bad health and the uncertain state of the atmosphere in this country have hitherto prevented him.

The planet Saturn has been much observed by Captain Kater, for the purpose of trying the light, &c. of his telescopes, for which the ring and satellites are good tests. The instruments which were employed in the present investigations were two Newtonian reflectors, — one, supposed by Watson, of 40 inches focus, and $6\frac{1}{4}$ aperture; and another, by Dollond, of 68 inches focus, and $6\frac{3}{4}$ aperture. The first, under favourable circumstances, gives a most excellent image; the latter is a very good instrument. The following are extracts from the author's journal.

"*Nov.* 25, 1825. — The double ring beautifully defined, perfectly distinct all round, and the principal belts well seen. I tried many concave lenses, and found that the image was much sharper than with convex eye-glasses, and the light apparently much greater. Dollond, 259 the best power; 480, a single lens, very distinct.

"*Nov.* 30. — The night very favourable, but not equal to the 25th. The exterior ring of Saturn is not so bright as the interior, and the interior is less bright close to the edge next the planet. The inner edge appears more yellow than the rest of the ring, and nearer in colour to the body of the planet.

"*Dec.* 17. — The evening extremely fine. With Dollond I perceived the outer ring of Saturn to be darker than the inner, and the division of the ring all round, with perfect distinctness; but with Watson I fancied that I saw *the outer ring separated by numerous dark divisions extremely close, one stronger than the rest dividing the ring about equally*. This was seen with my most perfect single eye-glass power. A careful examination of some hours confirmed this opinion.

"*Jan.* 16 and 17, 1826. — Captain Kater believed that he saw the divisions with the Dollond, but was not positive. Concave eye-glasses found to be superior to convex.

"*Feb.* 26, 1826. — The division of the outer ring not seen with Dollond.

" *Jan.* 22, 1828.—The evening remarkably fine, and the same appearances shewn as on the 30th November, 1825, but no divisions seen in the outer ring. I am, therefore, the more persuaded that they are not permanent." With the Dollond.

On the 17th December, when the divisions were most distinctly seen, Captain Kater made a drawing of the appearance of Saturn and his rings. The phenomena were witnessed by two other persons on the same evening, one of whom saw several divisions in the outer ring, while the other saw one middle division only; but the latter person was short-sighted, and unaccustomed to telescopic observations.

It will be remarked, that these divisions were not seen on other evenings, which yet were considered very favourable for distinct vision.

It seems that the same appearances were seen by Mr. Short, but the original record of his observations cannot be found.

In *Lalande's Astronomy* (third edition), article 3351, it is said, " Cassini remarked that the breadth of the ring was divided into two equal parts by a dark line having the same curvature as the ring, and that the *exterior* portion was the less bright." (*Mém.* 1715 p. 13.) Short *told* me that he observed still more singular phenomena with his large telescope of 12 feet.

The breadth of the ansæ, or extremities of the ring, was, according to him, divided into two parts,—an inner portion without any break in the illumination, and an outer, divided by several lines concentric with the circumference; which would lead to a belief *that there are several rings in the same plane.*

Delambre and Biot severally state, that Short saw the outer ring divided, probably on the authority of Lalande cited above. There is a note to the same purpose in Brewster's edition of *Ferguson's Astronomy*, but without reference to the source from which it is taken.

In December 1813, at Paris, Professor Quetelet saw the outer ring divided, with the achromatic telescope of 10 inches aperture, which was exhibited at the exposition. He mentioned this the following day to M. de la Place, who observed, that " those, or even more divisions, were conformable to the system of the world."

But, on the other hand, the division of the outer ring was not seen by Sir William Herschel (*Phil. Trans.* 1792), nor by Mr. Herschel in 1826, nor by M. Struve in the same year; and on several occasions when the atmospheric conditions were most favourable, it has not been seen by Captain Kater.

" It has been remarked by Sir William Herschel, by M. Struve, and by most persons who have observed Saturn, that the exterior ring is much less brilliant than the interior. May not this want of light in the outer ring arise from its having a very dense atmosphere? and may not this atmosphere in certain states admit of the divisions of the exterior ring being seen, though, under other circumstances, they remain invisible?

" With respect to the form of the edge of the inner ring of

Saturn next to the planet, the appearance under favourable circumstances is such as to leave no doubt on my mind of its being rounded."

2. Occultations observed at Biggleswade with the Society's Wollaston Telescope. By T. Maclear, Esq., Member of the Society.

The observations consist of 32 immersions and 15 emersions of stars behind the moon, from 8th August, 1829, to 3d May, 1830, given in sidereal time, with the circumstances of the phenomena.

As the value of such observations depends mainly upon the accuracy with which the time is known, Mr. Maclear gives a full description of the means employed by him for that purpose. His transit instrument is by Mr. Thomas Jones, of 30 inches focal length, and $2\frac{1}{2}$ aperture. This was placed in the meridian last September, and the azimuth screws have not been touched since. The position is ascertained by the transits of circumpolar stars, and the observations corrected for the deviation thus shewn. The west end was left with a small positive error; and the altitude screws have not been altered. The inclination of the axis is ascertained by the level, and the proper correction applied.

A meridian mark by Mr. Robinson, soldered into a well-fixed stone, and viewed through a lens of 34 feet focus, serves as a convenient and constant check upon the position of the instrument. A small dot near the mark serves for correcting the error of collimation; and when the instrument is thus corrected, no error can be detected by the transits of circumpolar stars.

The pivots of the transit were examined in the manner recommended by Professor Airy, and the difference between their radii ascertained. This is not the same at all altitudes; and it has been found necessary to obtain it for every 10°. Mr. Maclear shews how the value of this correction is to be obtained, and applies it to a case of Polaris.

"It may be remarked, that I have generally used a high power on the telescope; I have used what best suits my eye according to the state of the atmosphere, and the magnitude of the stars which undergo occultation. I first sweep the moon's apparent path with power 36, which comprehends a field of view sufficient to make allowance for the change of place produced by motion in N. P. D., and alteration of parallax. I next minutely re-examine with 75. This power is proper for observing stars down to the ninth magnitude, during the first and last six days of the lunation; but for magnitudes from 6 to 10, when the limb is bright, I employ a single eye-piece, power 160. It diminishes the moon's lustre, and renders the stars very distinct. The latter, when in contact with the limb, appear like those small lunar mountains seen during libration."

For the convenience of astronomers who possess telescopes mounted equatorially, Mr. Maclear recommends that the angular distance of the occulting point should be reckoned from the place where the circle of declination cuts the moon's disk.

	m	s	
The longitude of Mr. Maclear's Observatory by the trigonometrical survey	1	2,9	West.
By the immersion and emersion of Aldebaran, Oct. 15, 1829, compared with corresponding observations at the Royal Observatory	1	2,97	

	°	′	″
The latitude deduced from the survey	= 52	5	25·23
By a mean of 10 circum-meridian observations with a sextant, and 3 with Troughton's reflecting circle, Mr. Maclear found	52	5	25·3

3. On the Comet discovered at Marseilles in the constellation Equuleus. By James South, Esq. President.

"Our indefatigable associate, Monsieur Gambart, having had the kindness to transmit me the approximate place of this comet, discovered at Marseilles on the 21st of last month, I had the good fortune to find it on the evening of the day on which his communication reached me; and the following observations of it will, I trust, not be unworthy the Society's notice.

FIVE-FEET EQUATORIAL.

1830.	Sidereal Time.			Comet's R.A.			Comet's Decl.		
	h	m	s	h	m	s	°	″	′
May 1	17	50	46	21	14	34	+16	27	58
2	16	54	37	21	14	56	16	58	49
3	17	30	35	21	15	21	17	30	2
11	16	0	0	21	17	44	20	56	25
13	16	21	0	21	18	2	21	37	57

"In the 5-feet equatorial the comet is nearly circular, and about two minutes in diameter; its nucleus is well defined, and bears magnifying power better than that of any comet I have seen; although the moon's light was very considerable, it was found on the 1st of May without the slightest difficulty. On the moon's setting, its nucleus could be bisected with the wire of the 5-feet equatorial without difficulty. No tail could be perceived with that instrument; but at half-past two in the morning (civil reckoning), with powers 130 and 346, the 20-feet achromatic shewed a faint tail diffused across the field, the comet being placed at its circumference.

"On the 3d, at a quarter before three in the morning, with the 20-feet, the nucleus was well shewn with 130, 346, and 490; with 1000 it could be seen at moments, but with 1126 and higher powers it became an apparently uniform luminous cloud.

"This morning (May 14), from a quarter past one till a quarter past two, I viewed it with the 20-feet achromatic. With a power of 60, made expressly for the purpose by Messrs. Tulley, its nucleus was a brilliant point; with 130 it resembled the disk of Spica Virginis when seen with the 5-feet equatorial through slight haze;

with 252 it was elegantly defined; with 346, 430, and 490, at times beautiful; with 663, its limb sufficiently distinct to admit of micrometrical measurement; with 773, disk still visible; with 928, perceptible only by glimpses; and with 1126, 2440, and intermediate powers, a mere luminous cloud.

"With 252, a tail of extreme tenuity could be perceived; and with the higher powers, the luminous part of the comet being placed just out of the field, its direction could be at times detected. It is invisible to the naked eye; probably, however, in consequence only of the moon's light. Morning beautiful, heavy dew, and the object-glass, when the observations were concluded, had on it just sufficient dew to destroy its polished appearance.

4. Notice of the performance of the 20-feet achromatic, May 14, 1830.

"*Georgium Sidus.*—At half-past two, placed the 20-feet achromatic on the Georgium Sidus; saw it with 346, a beautiful planetary disk; not the slightest suspicion of any ring, either perpendicular or horizontal; but the planet three hours east of the meridian, and very low. Morning beautiful, but moonlight very strong, and the moon within three degrees of the planet.

"*Jupiter* (at a quarter before three), with 252 and 346, literally covered with belts, and the diameters of his satellites might have been as easily measured as himself. One came from behind the body, and the contrast of colour with that of the planet's limb was striking.

"*Mars* (near three o'clock).—The contrast of light in the vicinity of the poles very decided; on the 3d, several spots on his body, well and strongly marked. This morning, that about the south pole seems to overtake the body of the planet, and gives an appearance not unlike that afforded by the new moon, familiarly known as 'the old moon in the new moon's arms.'

"*Saturn* has been seen repeatedly with powers 130 to 928, under circumstances the most favourable; but not any thing anomalous about the planet or its ring could even be suspected."

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